

# Establishment and persistence of the copse snail, *Arianta arbustorum* (Linnaeus, 1758) (Gastropoda: Helicidae) in Canada

**Donald F. McAlpine**

New Brunswick Museum 277 Douglas Avenue, Saint John New Brunswick, CANADA E2K 1E5  
donald.mcalpine@nbm-mnb.ca

**Frederick W. Schueler**

Bishops Mills Natural History Centre RR # 2, Oxford Station Ontario, CANADA K0G 1T0

**John E. Maunder**

P.O. Box 250, Pouch Cove Newfoundland and Labrador, CANADA A0K 3L0

**Ronald G. Noseworthy**

Yale Academy 441-3 Seohong-Dong, Sogwipo Jejudo 697-080, REPUBLIC OF KOREA

**Mary C. Sollows**

New Brunswick Museum 277 Douglas Avenue, Saint John New Brunswick, CANADA E2K 1E5

## ABSTRACT

Although recorded from Newfoundland in 1885, by the late 1930s the copse snail, *Arianta arbustorum* (Linnaeus, 1758), was believed to no longer be extant in North America. We investigated sites in Newfoundland, New Brunswick, and Ontario, Canada and found that *A. arbustorum* is well established in these provinces; extant populations have persisted in Newfoundland for at least the past 30 years and in Ontario for more than 50 years. Where present in Canada, the species may sometimes be abundant, although populations are quite local, sometimes occupying less than 1 ha. Canadian Food Inspection Agency records show *A. arbustorum* to have been intercepted regularly (0–3 interceptions/year) since record-keeping started in 1963. Interceptions have occurred in 7 provinces spanning the country from Nova Scotia to British Columbia. Nursery stock originating in the Netherlands appears to be the main vector, but preliminary molecular data from Newfoundland populations suggests multiple European points of origin.

*Additional Keywords:* Introduced species, invasive species, Newfoundland, New Brunswick, Ontario

## INTRODUCTION

The copse snail, *Arianta arbustorum* (Figure 1), occurs commonly across northwestern and central Europe (Kerney and Cameron, 1979). Despite this widespread European distribution, and the significant number of European molluscan taxa now found in North America (Robinson, 1999), *A. arbustorum* has apparently never become established in the United States and has only rarely become established in Canada. Dundee (1974), in a list of introduced mollusks of eastern North America, noted interceptions of *A. arbustorum* by the US Department of Agriculture at ports in six eastern states, but neither Mead (1971) nor Dundee (1974) reported any

established populations. Until recently, the only published North American record of *A. arbustorum* is an 1885 observation from St. John's Newfoundland, reported by Whiteaves (1904). Grimm (1996) mentioned the occurrence of one colony in a ravine in Toronto, Ontario, but provided no details. Here we document the occurrence of *A. arbustorum* in Newfoundland, New Brunswick and Ontario and confirm the persistence or reintroduction of this species in Ontario and Newfoundland. We also review records of non-native plant pests intercepted by federal authorities from across Canada and show that *A. arbustorum* has been regularly imported into the country for more than 40 years.

## MATERIALS AND METHODS

Following discovery of *A. arbustorum* in western Newfoundland by RGN in 1970 and its subsequent discovery in New Brunswick in 2004, we accumulated data in each region in order to delimit local distribution. We also examined specimens deposited by the late F. W. Grimm in the Canadian Museum of Nature and consulted his unpublished field notes at the Bishops Mills Natural History Centre, for reference to Ontario occurrences. These notes plus additional occurrence information from entomologist D. Monty Wood, one of Grimm's correspondents, led DFM and FWS to make confirmatory searches of ravine sites in Toronto. In addition, Canadian Food Inspection Agency records, maintained since 1963, were examined and all interceptions of *A. arbustorum* noted, along with country of origin, number of snails intercepted, and plant host. Voucher material of *A. arbustorum* collected during this study is deposited in the collections of the Bishops Mills Natural History Centre (EOBM), the New Brunswick Museum (NBM), and the Provincial Museum of Newfoundland and Labrador (NFM).



**Figure 1.** Live *Arianta arbustorum*, central Saint John, New Brunswick, May 2007. Scale bar = 1 cm. Photo M. Sollows, 2007.

## RESULTS

**Ontario:** Collections data (Canadian Museum of Nature 059910 and Field Museum of Natural History 267829) provide more details on the Ontario population reported by Grimm (1996); material was collected from the Lawrence Park School complex on the north slope of Chatsworth Ravine, Toronto, 14–15 October 1970 by F.W. Grimm and J. Cavanaugh (43.720° N, 79.406° W; Figure 2a). Grimm's field notes also indicate material was collected by D.M. Wood from Rosedale Ravine, about 6 km away, around 1950. Unfortunately, vouchers from this site no longer exist. However, Wood recently stated that his material was collected opposite Parliament Street on the north side of the ravine at 7 Dale Avenue (43.673° N, 79.372° W, pers. comm. to DFM). Searches of the Chatsworth Ravine by FWS (May 2006) and DFM (September 2007) revealed that the population is still extant, at least on the basis of numerous fresh-dead shells; however, *A. arbustorum* (EOBM 1667; NBM 367; Figure 3) were uncommon relative to the co-occurring *Cepaea nemoralis* (Linnaeus, 1758). Dead shells were restricted to an area of ~1.5 h within the Chatsworth Ravine. Searches of the Rosedale Ravine by DFM and FWS in August and September 2007 revealed no *A. arbustorum*, although urban development and gated and fenced properties precluded our access to some areas.

**New Brunswick:** In 2004, DFM and MCS found a well established population of *A. arbustorum* in central Saint John (Site 2, Figure 2b; 45.270° N, 66.078° W; NBM 143, 8602). Collections were subsequently made elsewhere in the city (Greenhead, 45.267° N, 66.133° W; NBM 136; Figure 4; west Saint John, 45.249° N, 66.062° W; NBM 315). Locally, the species is abundant. Collection sites are 0.3–5.25 km apart and collectively encompass an area of ~20 h straddling the St. John River (Figure 2b).

**Newfoundland:** In 1970, RGN collected *A. arbustorum* from an urban garden close to the trans-island railway corridor on Chapel Hill (road), Deer Lake, in

western Newfoundland (Figure 2a; 49.16° N, 57.43° W; NFM MO-1971, 1972; [all lat/longs reported here are consistent with NADS3]) and from close to the Deer Lake Airport (49.1917° N, 57.4083° W; NFM MO-1970), but JEM was unable to relocate either of these populations in 2006. In 1976, RGN collected *A. arbustorum* at Petty Harbour-Maddox Cove (northern site) near St. John's (Figure 2c; 47.4853° N 52.7049° W; NFM MO-1973). In 1984, RGN and JEM again collected *A. arbustorum* from this locality (NFM MO-389). Subsequent observations and collections of the species in the general St. John's area by JEM and RGN between 1986 and 2007 include: Three Island Pond between Torbay and Bauline (47.6767° N, 52.7778° W), just east of Lundrigan's Marsh (47.6031° N, 52.6813° W), Kent's Pond (47.5864° N, 52.7242° W), a hydro pole-line near Oxen Pond Road (47.5825° N, 52.7535° W), Masonic Terrace (47.5656° N, 52.7072° W), Syme's Bridge (47.5433° N, 52.7244° W; Figure 5), Bowring Park (northern site) (47.5279° N, 52.7447° W), Bowring Park (southern site) (47.5222° N, 52.7547° W; NFM MO-684, 1370, 1391) and Petty Harbour-Maddox Cove (southern site) (47.4682° N, 52.7067° W).

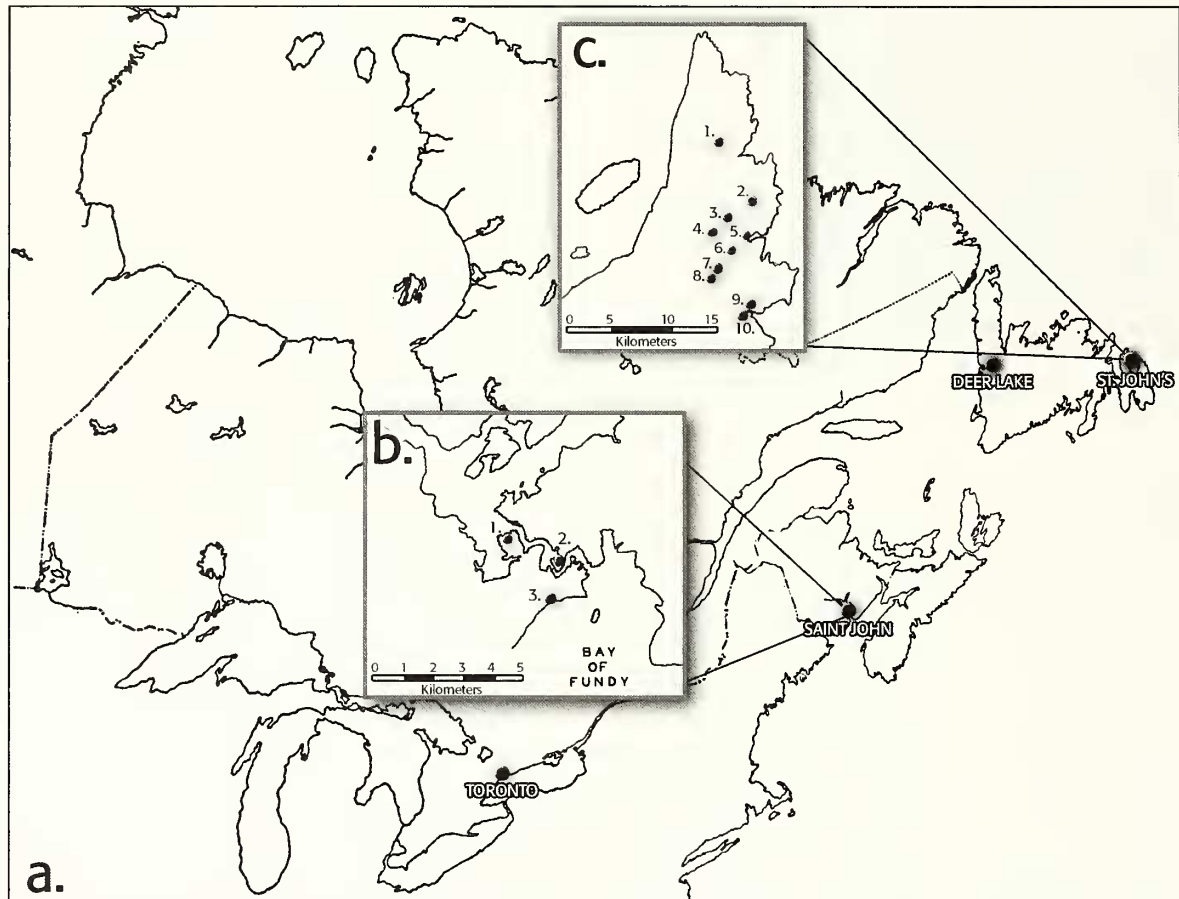
The total Newfoundland population of *A. arbustorum* presently occupies ten small localities (collectively covering ~1 ha; Figure 2c) within a narrow area of about 23.5 × 6 km radiating north-south from the original 1885 discovery site at the entrance to St. John's Harbour.

## Canada Food Inspection Agency Interceptions:

Table 1 summarizes records of *A. arbustorum* intercepted by the Canadian Food Inspection Agency at Canadian inspection stations since 1963. The species has been reported on 26 occasions (range of 0–3 interceptions/year) at stations in Nova Scotia, New Brunswick, Québec, Ontario, Saskatchewan, Alberta, and British Columbia, usually in association with a variety of garden plants imported from the Netherlands (73%), or, less commonly, other European countries (23%).

## DISCUSSION

Whiteaves (1904) reported *A. arbustorum* from "grassy slopes facing the sea near the narrows of St. John's Harbour, Newfoundland" in mid-July 1885. However, Brooks (1936) and Brooks and Brooks (1940) noted that their searches of the area around St. John's in 1934 did not reveal the species. Pilsbry (1939) suggested that the Newfoundland population might no longer persist and deemed the species a "rather doubtful member of the American fauna". The Petty Harbour-Maddox Cove population was very small when discovered in 1976, and does not appear to have spread much since. The Petty Harbour-Maddox Cove localities are physically separated from the eight remaining sites by the steeply rising 200+ m north-south trending Southside Hills. Likewise, the Bowring Park (southern site) population was also very small when it was discovered in 1986, restricted to the grounds of an old estate. However, it appears to have



**Figure 2.** a. Eastern North America showing sites (•) in Ontario, New Brunswick and Newfoundland where *Arianta arbustorum* has been reported. b. Saint John, New Brunswick with sites of occurrence for *A. arbustorum*; 1. Greenhead; 2. Saint John central; 3. Saint John west. c. St. John's, Newfoundland and environs with sites for *A. arbustorum*; 1. Three Island Pond; 2. Lumdrigan's Marsh; 3. Kent's Pond; 4. Oxen Pond; 5. Masonic Terrace; 6. Symes's Bridge; 7. Bowring Park north; 8. Bowring Park south; 9. Petty Harbour-Maddox Cove north; 10. Petty Harbour-Maddox Cove south.

spread significantly during recent years and is probably the source of the eight occurrences now known in the main St. John's area. Preliminary molecular data suggest that the present-day Newfoundland populations are derived from at least two separate introductions from Europe; the Petty Harbour-Maddox Cove populations being genetically distinct from the greater St. John's area populations (A. Grindon, Nottingham University, pers. comm. to DFM). The Deer Lake records may represent ephemeral populations derived from snails transported from St. John's in rail cargo, since both localities are located along the former trans-island railway corridor.

Although the area occupied by *A. arbustorum* in New Brunswick suggests a long-standing population, it is not possible to estimate a likely date of introduction for *A. arbustorum* to Saint John. Matthew and Stead (1903) made no mention of the species in their list of land and freshwater mollusks collected in and near Saint John about 1890–1900. Unfortunately, the mollusk survey of Coleman (1966) conducted in Saint John is incomplete, even for the marine and freshwater species sampled.

An undated collection record in the Field Museum of Natural History (FMNH 38439) reports a single dry shell from "Selkirk, New Brunswick". A search of recent and historical gazetteers reveals no such location in that province. The specimen and original label appear to be missing. The specimen was originally in the collection of G.K. Gude, a malacologist resident in the United Kingdom, who was active in the early 20<sup>th</sup> Century. Gude produced very small labels and it seems quite likely that he would have abbreviated his label data (J. Gerber, pers. comm. to DFM). We suggest that this record as reported is the result of an error in transcription. While it may refer to Selkirk, Manitoba (MB), rather than New Brunswick (NB), the record may not even be North American. Gude undoubtedly exchanged widely; however his research interests focused on regions outside the North American continent, and there is no material from the Gude Collection now in the Field Museum labeled as being from Manitoba.

Considering that *A. arbustorum* is widely distributed and common in Europe, and appears to be imported not



**Figures 3–5.** Representative specimens of *Arianta arbustorum* from 3. Ontario (NBM 366), 4. New Brunswick (NBM 355), and 5. Newfoundland (NBM 8355). Scale bar = 2 cm.

infrequently into Canada, it is surprising that the species has not been recorded as more widely established in temperate regions of North America. Robinson (1999) listed the species as an uncommonly imported invasive, accounting for <0.1 % of more than 4,900 US interceptions over about a 6-year period. Although this percentage is small, it still accounts for a sizable number of animals. In Canada, <5% of tropical plants from the United States are examined but 100 % of off-continent nursery stock is inspected (D. Parker, pers. comm. to DFM). One interception at Edmonton, Alberta, in 1999–2000 originated at Goulds, South Florida. As there are no vouchers for this interception the identification cannot be confirmed. However, given the species restriction to north-temperate latitudes in Europe, establishment of *A. arbustorum* in Florida seems unlikely.

In summary, *A. arbustorum* may have persisted for more than a century on Newfoundland or may have

been repeatedly introduced; preliminary evidence indicates multiple introductions. It has also been present in New Brunswick and Ontario for some time. Further investigation may reveal that this European alien is more widely distributed at temperate latitudes in North America than was previously thought.

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**Table 1.** Canadian records of interceptions of *Arianta arbustorum* 1963–2005.

Year	Location	#	Host Origin
1964–65 Belgium	Ontario	1	<i>Quercus</i>
1965–66 Netherlands	Quebec	1	<i>Lonicera</i>
1966–67 Belgium	Saskatchewan	1	<i>Berberis</i>
1967–68 Europe; Monaco	Quebec	2	Herbaceous plants
1968–69 Belgium	Quebec	2	<i>Acer</i> ; packing with plants
1969–70 Netherlands	British Columbia	1	<i>Aesculus</i>
1970–71 Netherlands	Quebec	1	Packing with plants
1971–72 Netherlands	British Columbia	1	Packing with plants
1972–73 Netherlands	Nova Scotia	1	<i>Pinus</i>
1976–77 Netherlands	Saskatchewan	1	<i>Sambucus</i>
1979–80 Netherlands	British Columbia	1	<i>Spiraea</i>
1980–81 Netherlands	Quebec; British Columbia	3	<i>Caragana</i> ; <i>Malus</i> ; <i>Rosa</i>
1982–83 Netherlands	Quebec	1	Packing with plants
1986–87 Netherlands	Québec; Saskatchewan; Alberta	3	<i>Caragana</i> ; <i>Rosa</i> ; <i>Viburnum</i>
1989–90 Netherlands	Quebec; British Columbia	3	Plants; <i>Sambucus</i> ; <i>Sphagnum</i>
1998–99 Netherlands	Quebec	1	<i>Caragana</i>
1999–2000 Florida	Alberta	1	<i>Ficus</i>
2004–05 Netherlands	New Brunswick	1	<i>Tilia</i>

to our enquiries. A. Grindon, Nottingham University for preliminary molecular data. R. Forsyth drew our attention to the Sellkirk record in the Field Museum of Natural History.

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